The Central African Journal of Medicine

Supplementary Issue to 1992 Volume 38,
1991 University of Zimbabwe Annual Research Day

Vol. 38, No. 2, February, 1992

Immunisation and nutritional status of under-fives in rural Zambia

A M ZONDAG, J L NOUWEN,
H W A VOORHOEVE

INTRODUCTION

In 1987 in three regions around the Kamoto Hospital, the nutritional status of under-fives was studied to investigate the prevalence of malnutrition and some of its possible contributing factors, such as maternal education and the immunisation status of the children. The main aim of the study was to confirm the clinical impression of a different nutritional status in the tree regions and to get more information about the contributing factors for those differences.

The regions differ in socio-economic level and distance from the hospital:

a) Jumbe is within easy reach of the hospital on a distance within 5 kilometre with mainly government employees. This is a village with some shops. The standard of living in this area is, therefore, relatively high.

b) Masumba and Kakumbi: These are two different parts in one region; each with their own Rural Health Centre on a distance of about 50 (Masumba) and 70 kilometres (Kakumbi) from the hospital, but with a good road. It is an area with an airport and there are many safari lodges. Here money is earned from tourism.

c) Chibembe is also at a distance of 70 kilometres from the hospital, however without a good road. In the rainy season, this region is mostly isolated from the hospital and from the rest of the area. It is situated between two wild parks, but tourists can only reach this area in the dry season (4 months a year). Also, elephants destroy the crops.

METHODS

The investigation is done by looking for the availability of the under-five records in all under-fives to get information about age, sex and immunisations of the under-fives.

The nutritional status of the 1–5-year-old children is measured by the Mid Upper Arm Circumference (MUAC), a general accepted measurement for the nutritional status.[1,2,3]

The MUAC is also a simple measurement practicable in rural areas where measuring height is a too difficult procedure in routine under-five clinics. Besides, the MUAC is nearly independent of age for 1–5-year-olds.

A standard questionnaire of 22 questions is asked to the mothers, among others about their education, breast-feeding, the number of meals a day, water supply and sanitation (pit latrine).

The villages are visited separate from the routine mobile under-five clinics, but with the full consent of the Chiefs and the co-operation of the Community Health Workers. Some days before, the villages were informed about the arrival, the time and the place of the investigation.

Population: A total of 1 251 children is seen of which 1 222 are under five years of age and 29 are 5 years and some months. the number of investigated children per sex and region is given in Table I. In each region, there are a little more male than female under-fives.

RESULTS

Table I: Sex distribution per region

	Male		Female		Total	
	N	pc	N	pc	N	pc
Jumbe	277	51,1	265	48,9	542	43,3
Masumba/ Kakumbi	180	50,7	175	49,3	355	28,4
Chibembe	181	51,1	173	48,9	354	28,3
Total	638	51,0	613	49,0	1 251	100,0

The age of the investigated children is given in Table II overleaf.

The education of the mothers of our population of 1 251 children is presented in Table III.

Table III: Education of the Mothers of 1 251 Children (regions together)

School in Years		N	pc	Cum pc
No. School	1	514	41,1	41,1
Primary	1	15	1,2	42,3
	2	26	2,1	44,4
	3	26	2,1	46,5
	4	190	15,2	61,7
	5	99	7,9	69,6
	6	91	7,3	76,9
	7	228	18,2	95,1
Secondary	1	9	0,7	95,8
	2	12	1,0	96,8
	3	25	2,0	98,8
	4	4	0,3	99,1
	5	12	1,0	100,1
		1 251	100,1	100,1

No school education at all is seen in 40 pc of the mothers and up to 54 pc had some years of primary education: 15,2 pc passed Grade Four, 7,3 pc had six years of primary school education and even 18,2 pc finished grade seven. Less than five percent of the mothers visited a secondary school and only one percent of the mothers finished the secondary school.

The maternal education for each region is given in Table IV. Here the years of primary education are taken together. The same is done for the five years of secondary education.

Table IV: Maternal Education per Region
(of 1 251 children in percentages)

Regions	Jumbe	Masumba/ Kakumbi	Chibembe	Total
	N = 542	N = 355	N = 354	1 251
No school	38,6	38,0	48,0	
Primary 1–7	53,9	58,3	49,7	
Secondary 1–5	7,6	3,7	2,3	
	100,1	100,0	100,0	

The figures of Table IV show that maternal education in Chibembe is obviously less than in the other regions. Nearly 50 pc of the mothers have no education at all. Secondary school education in this region is lowest of all regions. In Jumbe, the secondary school education is the best of all regions.

Immunisation status according to region: In Zambia, immunisations are given according to the WHO/UNICEF Extended programme of immunisations, known as E.P.I. So the total number of immunisations include BCG, usually given at

Table II: Age distribution per region

Age	Jumbe		Masumba/Kakumbi		Chibembe		Total	
(in months)	N	pc	N	pc	N	pc	N	pc
0–6	68	13,1	47	13,4	83	23,6	198	16,2
6–12	54	10,4	46	13,1	84	23,9	184	15,1
12–18	68	13,1	43	12,3	55	15,6	166	13,6
18–24	45	8,7	44	12,5	37	10,5	126	10,3
24–30	49	9,4	36	10,3	26	7,4	111	9,1
30–36	46	8,9	37	10,5	24	6,8	107	8,8
36–42	45	8,7	27	7,7	19	5,4	91	7,4
42–48	53	10,2	22	6,3	11	3,1	86	7,0
48–54	47	9,1	24	6,8	8	2,3	79	6,5
54–60	44	8,5	25	7,1	5	1,4	74	6,1
0–60	519	42,5	351	28,7	352	28,8	1 222	100
>60	23		4		2		20	
Total	542	43,3	355	28,4	354	28,3	1 251	100

Table V: Availability of Under-Five Cards per Region (of 1 251 children in percentages)

Region	Jumbe		Masumba/Kakumbi		Chibembe		Total	
	N = 542		N 355		N = 354	1 251		
	N	pc	N	pc	N	pc	N	pc
No present	185	34,1	93	26,2	104	29,4	382	30,5
Card present	357	65,9	262	73,8	250	70,6	869	69,5

Table VI: Immunisation Status per Region (of 1 251 children, in percentages)

Region	Jumbe		Masumba/Kakumbi		Chibembe		Total	
	N	pc	N	pc	N	pc	N	pc
Unknown (no card)	201	37,1	99	27,9	106	29,9	406	32,5
Incomplete (1–7)	119	22,0	102	28,7	154	43,5	375	30,0
Complete (8–11)	222	41,0	154	43,4	94	26,6	470	37,6
Total	542	100,1	355	100,0	354	100,0	1 251	100,1

birth, DTP I, II, III and a booster. Oral Polio Vaccine (OPV) I, III, III and a booster and measles. At least eight immunisations: BCG, DTP III, OPV III and measles are considered as complete.

In each region, the immunisation status of the children is checked from the Under-Five Cards. If the card was not available, the immunisation was considered as unknown. However, it is recognised that a number of most older children are presumed immunised.

To interpret well the figures about the immunisation status of the children (Table V), we present first the availability of the Under-Five Cards per region in Table V.

The Chibembe region shows the highest number of incomplete immunisations. The high number of unknown immunisations in Jumbe is presumable because of the high number of older children in that region (see Table II). Especial in the older children, the Under-Five Card was no longer available.

Table VII: Nutritional Status of Children 12–60 months (Measured by Mid-Arm Circumference [per region])

Region	Jumbe		Masumba/Kakumbi		Chibembe		Total	
MUAC in cm	N	pc	N	pc	N	pc	N	pc
<12,5	35	9,1	14	5,6	20	10,8	69	8,3
12,4–13,5	54	13,7	48	18,7	39	21,1	141	16,9
13,5	305	77,4	195	75,9	126	68,1	626	74,9
	394	100,2	257	100,2	185	100,0	836	100,1

Nutritional status: The nutritional situation of the children 12–60 months is measured by the MUAC. For each region, the results are presented in Table VII.

The nutritional status of the children in Chibembe is the lowest of all regions. There are less children with a really sufficient nutritional status and the most with an obvious insufficient nutritional status.

In Masumba/Kakumbi, the percentages of children with insufficient nutritional status is the lowest. Otherwise the nutritional status seems more or less the same as in Jumbe.

Nutritional status according to immunisation status: The relationship between immunisation and nutritional status is given for the well-known immunisations in Table VIII. The inaccurate number of unknown immunisations of Table V are excluded as they should give a disturbing effect.

Table VIII: Nutritional and Immunisation Status (Children 12–60 months [all regions together])

MUAC in cm.		Number of immunisations		
		1–7	8–11	Total
<12,5	N	23	40	63
	pc	14,6	10,2	11,5
12,5–13,5	N	35	73	108
	pc	22,3	18,7	19,7
13,5	N	99	277	376
	pc	63,0	71,0	68,7
Total	N	157	390	547

The figures of Table VIII show clearly that the nutritional status of the complete immunised children is better than the nutritional status of the incomplete immunised children.

DISCUSSION

Although a lot of data were collected, as mentioned in the method, after all they were not all very useful. So only the results for maternal education, availability of under-five records, immunisation status and nutritional status according to region are presented here.

It is impossible to give a clear interpretation of the figures of the jumbe region because of the high number of unavailable records (Table VI), presumably caused by the higher percentages of children over 36 months (Table II) of which the records are lost. For the two other regions, the figures are reliable for interpretation.

In the Chibembe region, the prevalence of malnutrition is the highest (10,8 pc) and the maternal education is lowest of the three regions just as the number of complete immunisations of the children.

In the Masumba/Kakumbi region, the prevalence of malnutrition is the lowest (5,6 pc) of the three regions and maternal education the highest, just as the percentage of complete immunisations. These correlations are in accordance with the literature from Cameroun and Lesotho.[4,5]

In Masumba/Kakumbi the percentage of available under-five records is higher than in Chibembe. In the last region, the percentage of unavailable records is higher.

For the 1-5-year-old children with well-known immunisations of the three regions together, there is a clear correlation between the immunisation status and the nutritional status as presented in Table VIII. The better the immunisation status the better the nutritional status.

A prevalence of malnutrition from 5,6 pc in Masumba/Kakumbi and 10,8 pc in Chibembe are of the same range as the figures we found in 1983 in some villages in the western province of Zambia.

CONCLUSIONS

The reverse relation between maternal education and malnutrition, well known from literature, is also seen in our study results. In the Chibembe region with the lowest maternal education, the complete immunisations and nutritional status are also the lowest just as the available records.

The Masumba/Kakumbi region with the highest maternal education has also the highest percentage of available records, completed immunisations and the best nutritional status.

For the 1–5-year-old children of the three regions together children with a complete immunisation have a better nutritional status than those with an incomplete immunisation.

Maternal education as important determinant of child health should be taken into account for each child at under-five clinics.

A socio-economic questionnaire is not useful to improve everyday child health.

Measurement of the mid-upper arm circumference (MUAC) should be routine at under-five clinics certainly where measurement of heights is too complex, time consuming and not done.

ACKNOWLEDGEMENT

We express our great appreciation to Prof H A Valkenburg, at the time Professor of Epidemiology. Erasmus University, Rotterdam, who make this investigation possible.

REFERENCES

1. Blankhart, F M: Experiences in Sierra Leone and Zambia. In: The Arm circumference as a Public Health Index of Protein-Caloric Malnutrition of early Childhood. Monography No. 8, *Journal of Tropical Paediatrics*, 1969; 15: 205–208.
2. Shakir, A and Morley, D: Measuring malnutrition. *The Lancet* 1974; i: 758.
3. McDowell, J and King, T D: Interpretation of Arm Circumference as indication of nutritional status. *Arch Dis Child.* 1984; 57: 292–296.
4. Peerenboom, P B G: Les Soins de Sante au Cameroun. Academic Thesis, Amsterdam, 1987; 91.
5. Tjon a Ten, W.: Growth of the Mosotho Pre-school child. Academic Thesis, Amsterdam 1989; 117.
6. Voorhoeve, H W A: Growth and Nutrition of Zambian Children. *Central African Journal of Medicine*, 1985; 31: 224–227.